



US011902602B1

(12) **United States Patent**
Nijim et al.

(10) **Patent No.:** **US 11,902,602 B1**
(45) **Date of Patent:** **Feb. 13, 2024**

(54) **COMBINING VIDEO CONTENT FEEDS**

(71) Applicant: **Cox Communications, Inc.**, Atlanta, GA (US)

(72) Inventors: **Yousef Wasef Nijim**, Cumming, GA (US); **James Alan Strothmann**, Johns Creek, GA (US); **Michael Paul Overcash**, Duluth, GA (US)

(73) Assignee: **COX COMMUNICATIONS, INC.**, Atlanta, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 101 days.

(21) Appl. No.: **16/807,962**

(22) Filed: **Mar. 3, 2020**

(51) **Int. Cl.**

H04N 21/236 (2011.01)

G06F 16/735 (2019.01)

G06F 16/783 (2019.01)

H04N 21/2365 (2011.01)

(52) **U.S. Cl.**

CPC **H04N 21/23614** (2013.01); **G06F 16/735** (2019.01); **G06F 16/7844** (2019.01); **H04N 21/2365** (2013.01)

(58) **Field of Classification Search**

CPC **H04N 21/23614**; **H04N 21/2365**; **G06F 16/735**; **G06F 16/7844**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,134,133 B1 * 11/2006 Wugofski H04N 21/47 725/39

8,930,999 B1 * 1/2015 Maeng H04N 21/4347 725/41

9,800,933 B1 * 10/2017 Strothmann H04N 5/445
9,980,007 B1 * 5/2018 Thompson H04N 21/482
2005/0036068 A1 * 2/2005 Shin H04N 21/84 348/588
2015/0082352 A1 * 3/2015 Cloutier H04N 21/4826 725/46
2018/0254920 A1 * 9/2018 Shaw H04L 12/4641

OTHER PUBLICATIONS

Jared Newman, How to get a single channel guide for both over-the-air and streaming TV, TechHive, Aug. 1, 2019, 9 pages.

* cited by examiner

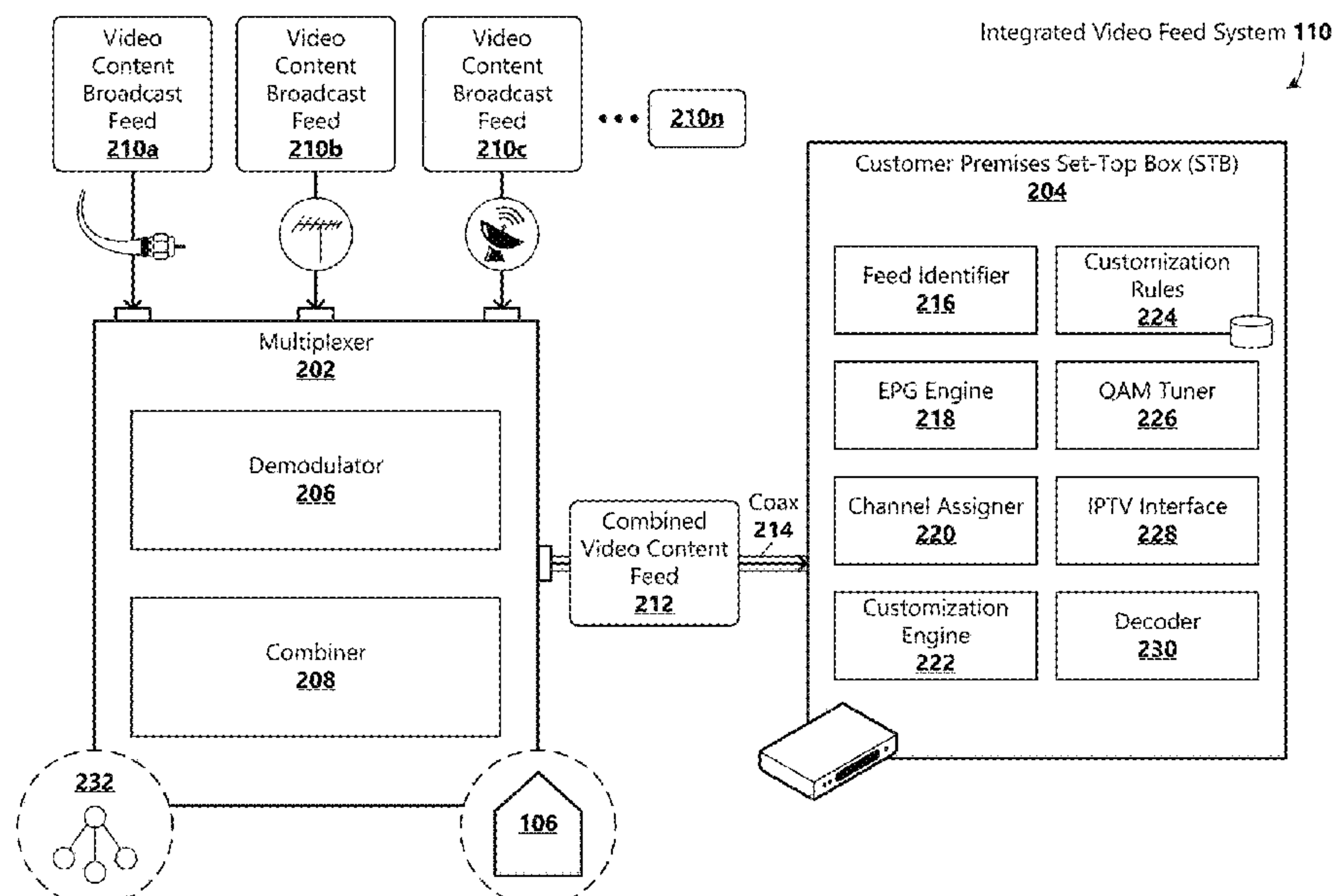
Primary Examiner — Oschta I Montoya

(74) *Attorney, Agent, or Firm* — Merchant & Gould P.C.

(57) **ABSTRACT**

Combining a plurality of video feeds of various modulation formats and from a variety of sources for providing a unified interface and an extension of services across the plurality of video feeds is provided. An integrated video feed system located at least in part at a subscriber premises is configured to receive a plurality of video content broadcast feeds (e.g., cable television, over the air television, satellite television, Internet Protocol television), generate a combined data feed comprising video content signals included in the plurality of video content feeds, identify and decode the video content signals, obtain additional data associated with each of the plurality of video content feeds, provide a unified interface for displaying an aggregation of data and services associated with the plurality of video content feeds, and to provide requested video content included in the plurality of video content broadcast feeds for playback on a display device.

20 Claims, 7 Drawing Sheets



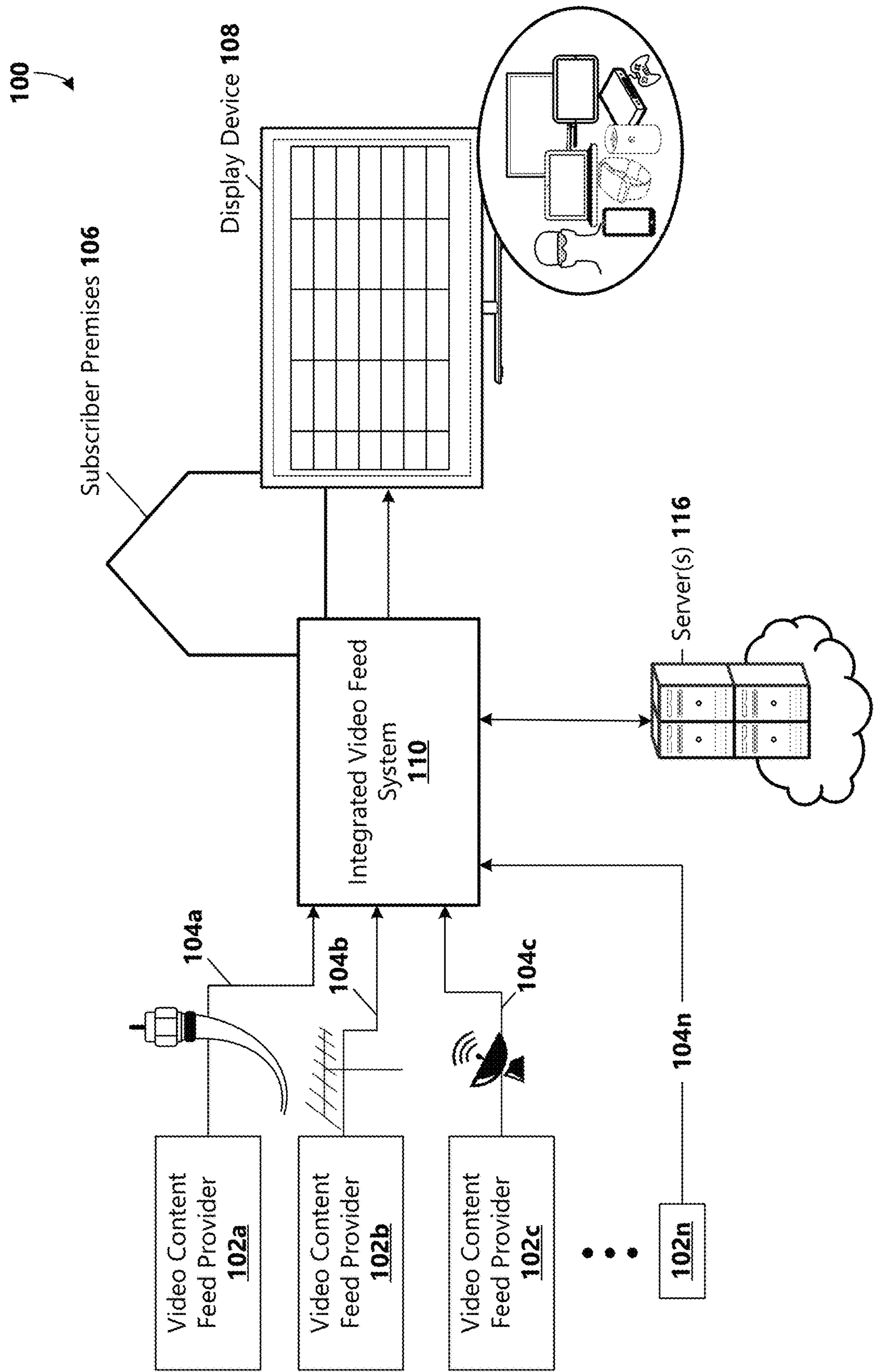


FIG. 1

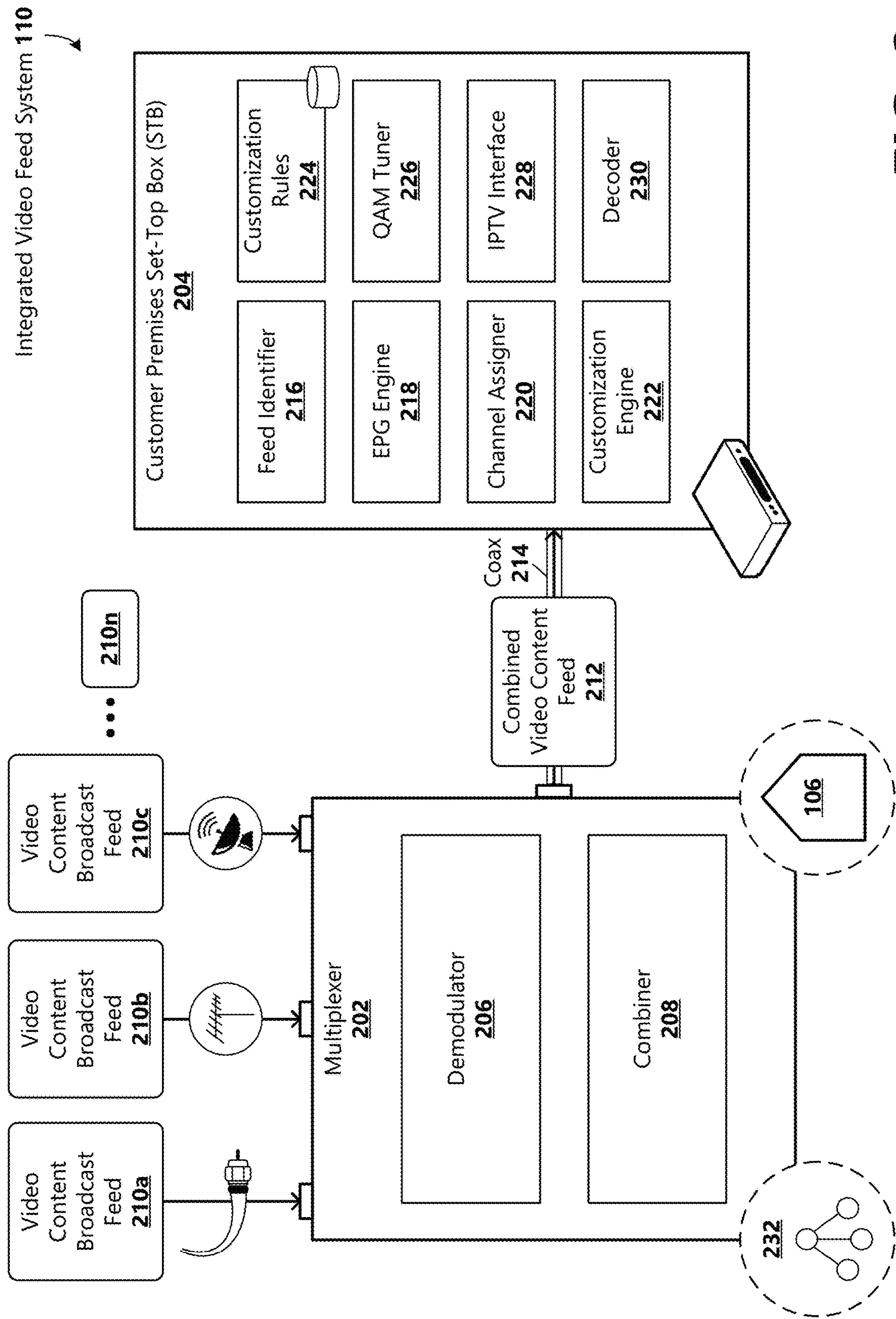


FIG. 2

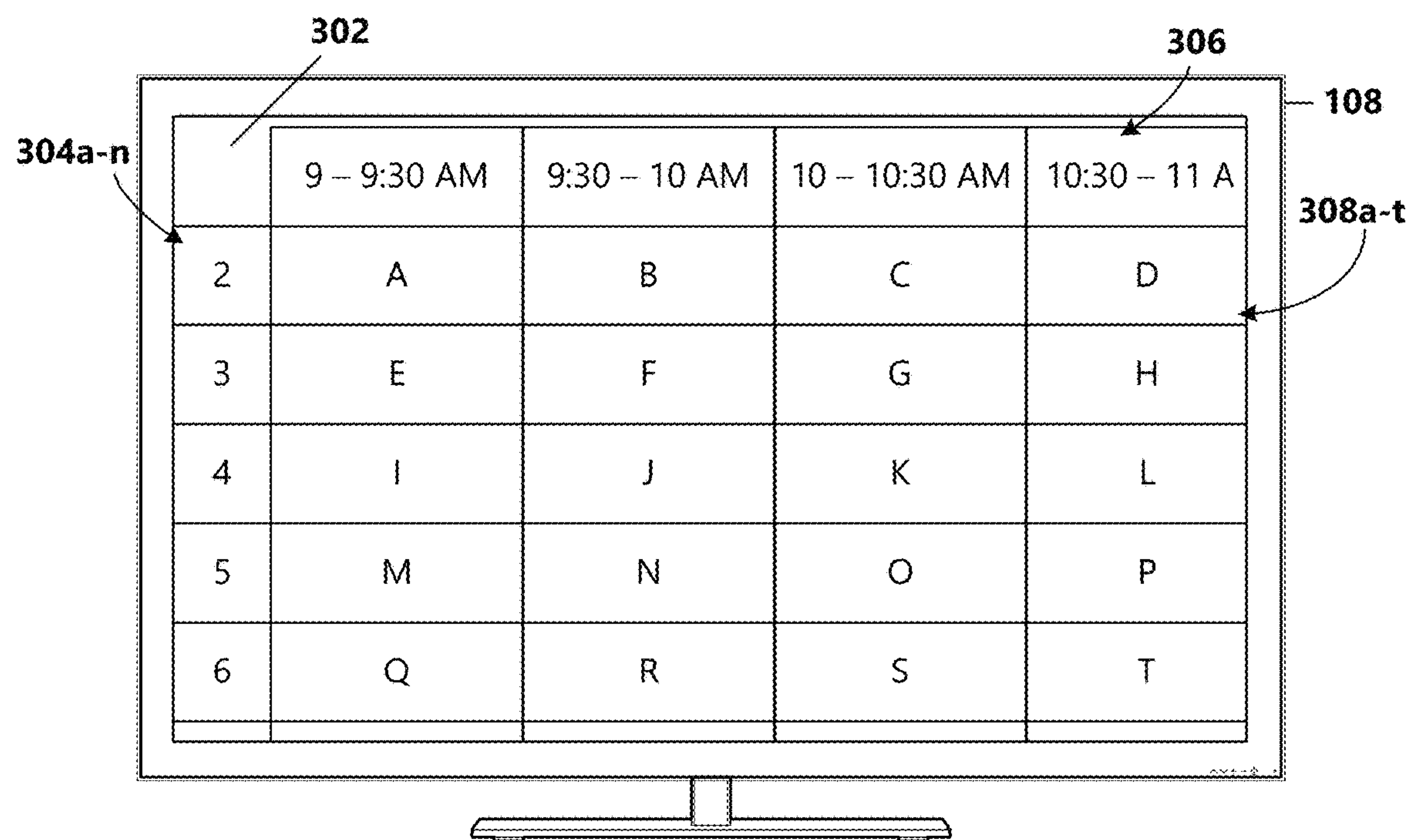


FIG. 3A

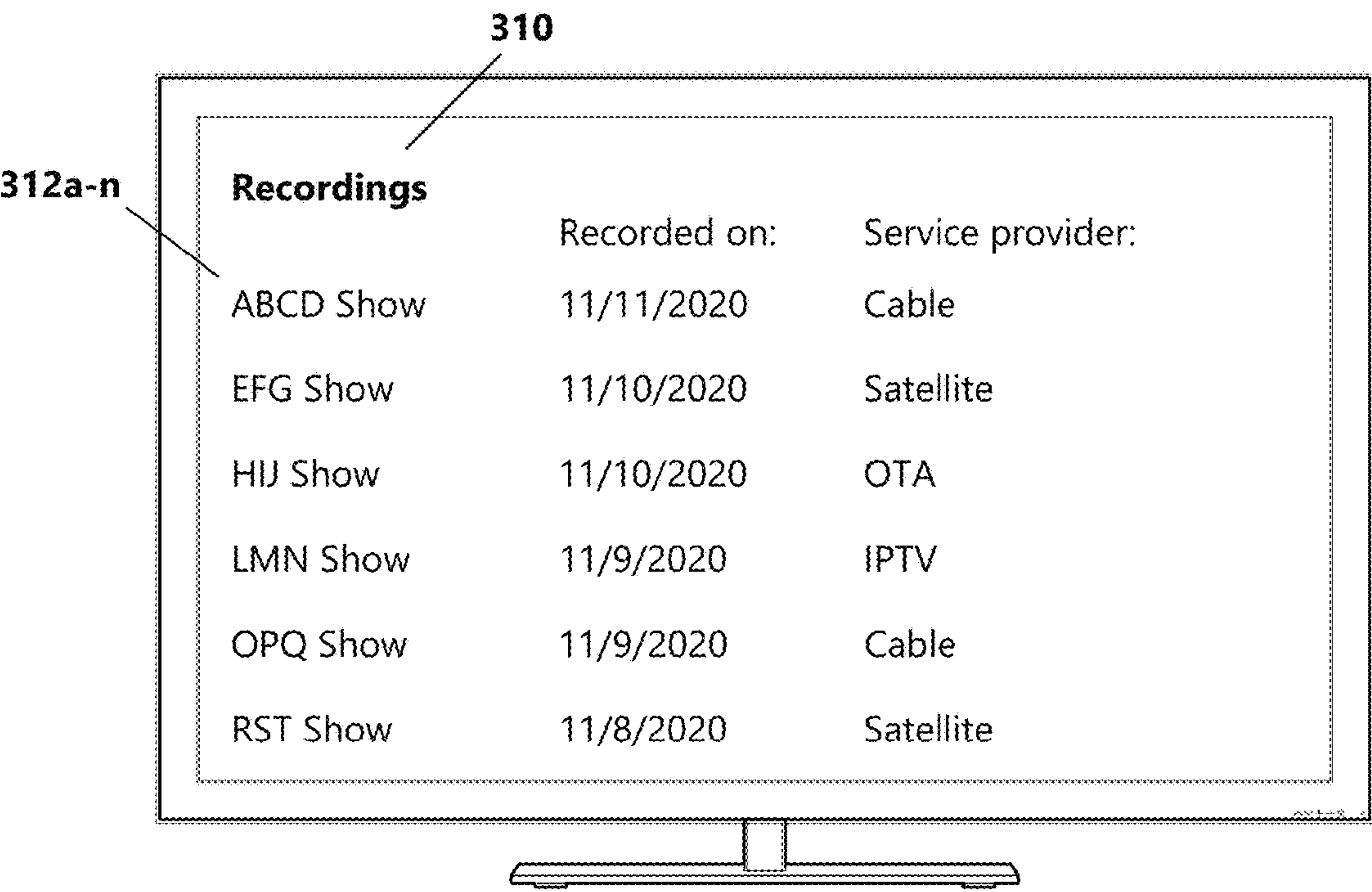


FIG. 3B

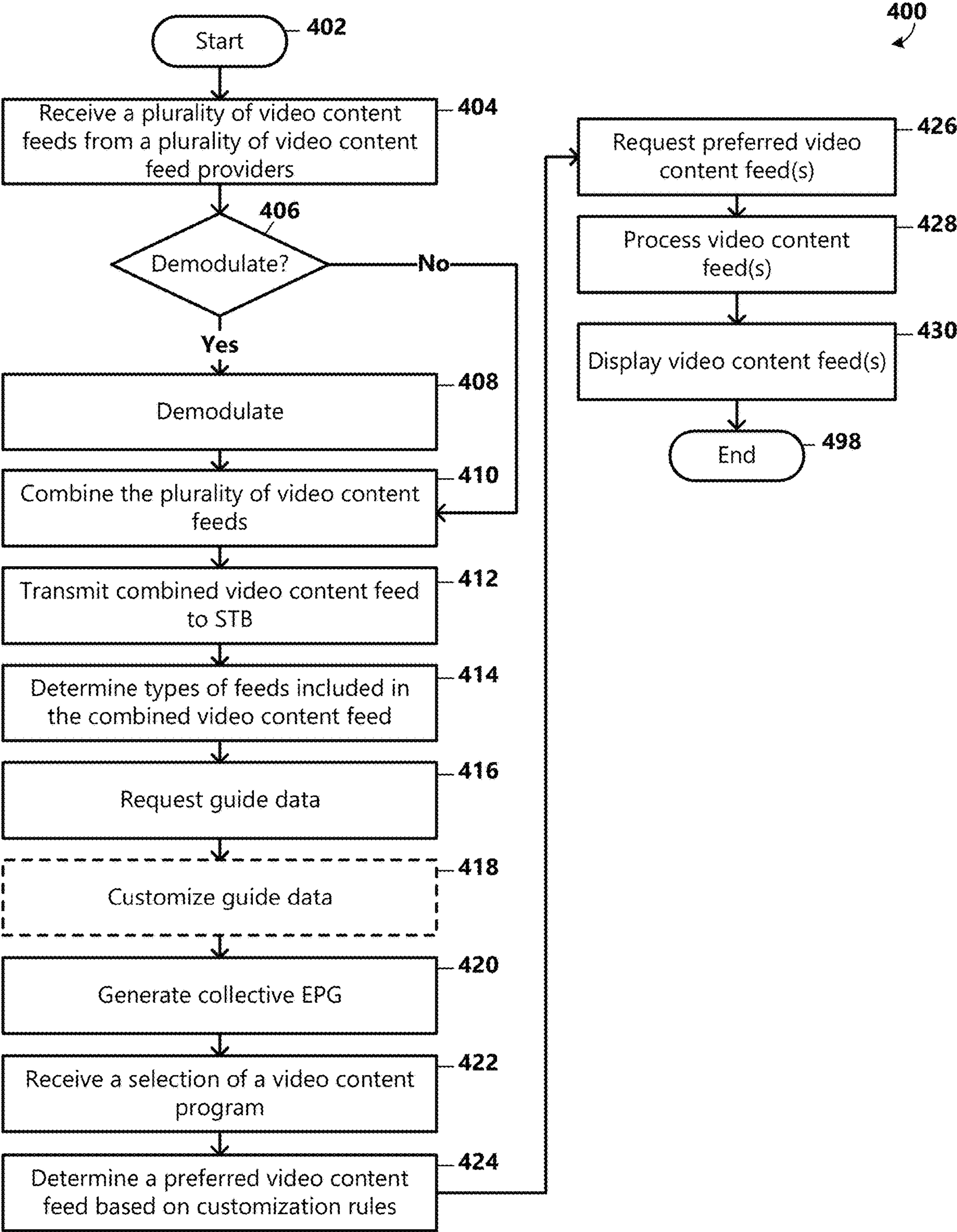


FIG. 4

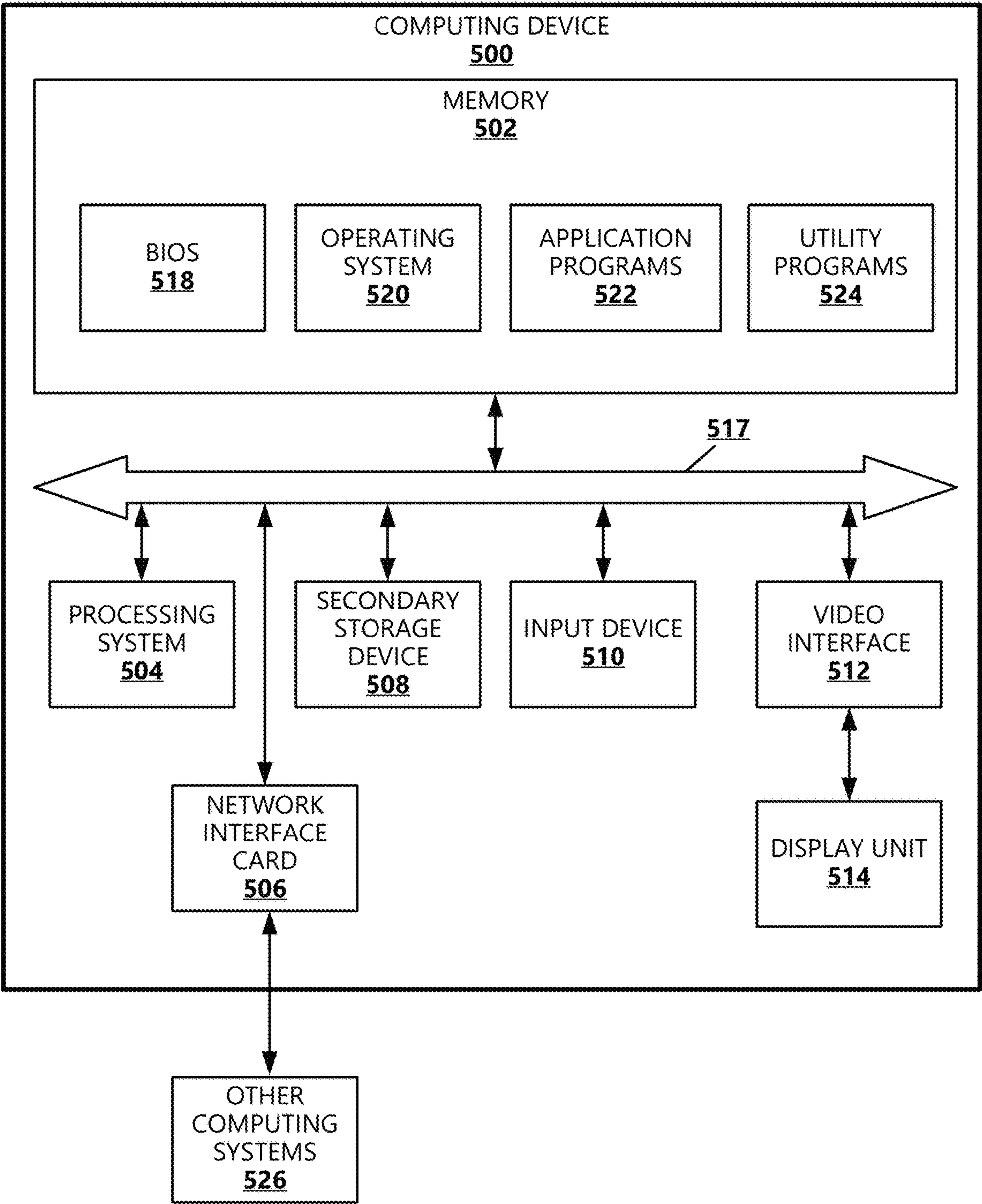
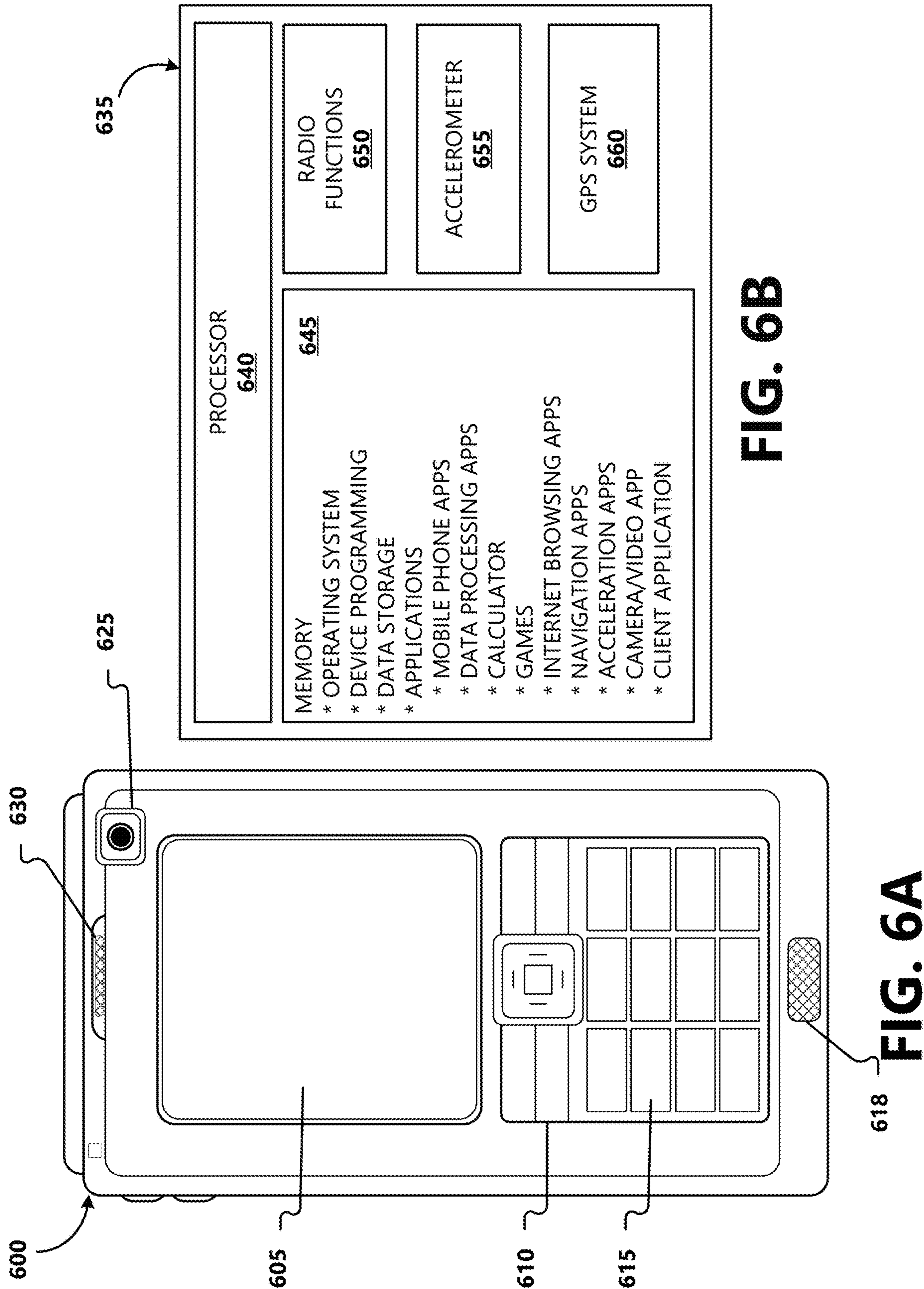
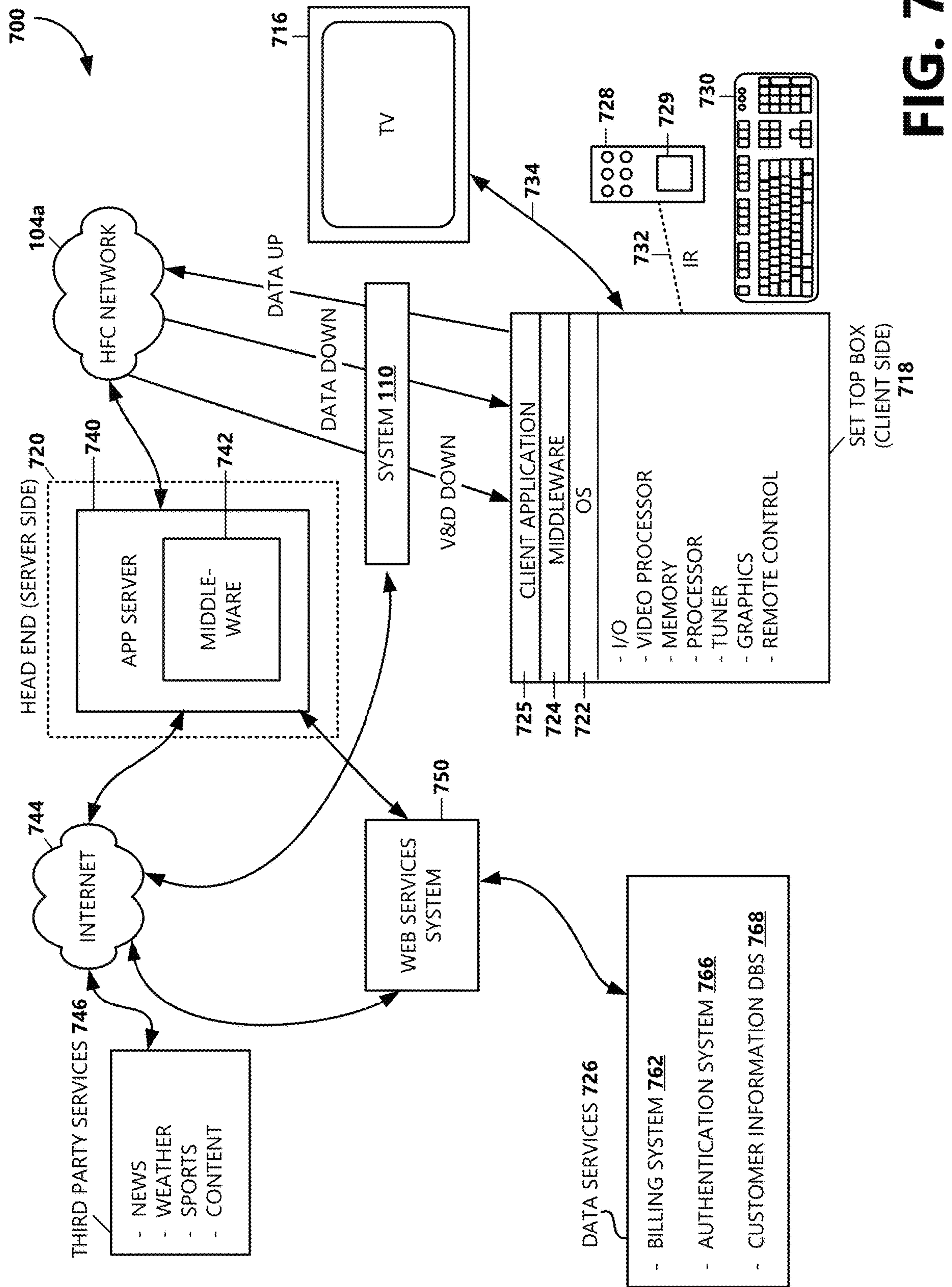


FIG. 5





COMBINING VIDEO CONTENT FEEDS**BACKGROUND**

Cable television subscribers may subscribe to and/or consume video content services from a variety of sources. For example, in addition to receiving cable television content and services from a cable services provider delivered via a hybrid fiber-coaxial (HFC) network, a subscriber may also receive video content and services from other sources, such as satellite television content from a satellite television service provider transmitted via a communications satellite, IPTV (Internet Protocol Television) video content delivered over the Internet, and local television (OTA (Over-The-Air)) content transmitted by a local broadcaster via radio waves.

While having access to various video content feeds may provide a subscriber with access to a greater amount and wider variety of content and services, current technologies are limited to providing these various feeds as separate services. For example, in some cases, accessing and processing certain types of video content signals may require the use of specialized equipment and/or different service providers. In other cases, an end device may be configured to receive different video content feeds from a plurality of sources; however, current technologies may be limited to the processing and presentation of a single feed at a time. Accordingly, to consume video content or services provided by various providers, the subscriber may be required to switch between inputs or applications. As can be appreciated, having to switch between inputs or applications to consume content from disparate sources can be considered a discontinuous user experience that may not only be inefficient, but may also be frustrating to the subscriber. Additionally, providing the various feeds as separate services may not allow for providing a common electronic programming guide interface to display programs offered by a plurality of video content providers, or for recommendations, favorites, recordings, etc., across the various feeds to be provided in a common interface.

Due to the above-described deficiencies and limitations of disparate video content consumption, an alternative technical solution is needed to provide an integration of disparate video content feeds for enabling access to content and services provided by various sources using a single interface.

SUMMARY

Aspects of the present disclosure provide a system, method, and computer readable storage device for combining a plurality of video feeds of various modulation formats and from a variety of sources for providing a unified interface and an extension of services across the plurality of video feeds. The system may include a multiplexer configured to receive the plurality of video content feeds, demodulate video content feeds based on a feed type, combine the plurality of video content feeds, and transmit the combined video content feed to a set top box. The set top box may be configured to receive the combined video content feed, identify and decode the video content signals, obtain additional data associated with each of the plurality of video content feeds, provide a unified interface for displaying an aggregation of data and services associated with the plurality of video content feeds, and to provide requested video content included in the plurality of video content broadcast feeds for playback on a display device. Moreover, aspects provide an integration of the various services (e.g., recom-

mendations, favorites, recording, closed captioning, parental controls) through a service provider as part of offering services delivered over a plurality of delivery networks.

The unified interface may include an aggregated electronic programming guide that enables users to easily navigate available content across the plurality of video feeds without having to switch between applications or inputs. The aggregated electronic programming guide may further include recommendations, favorites, and recordings across the plurality of video feeds. A customization engine may additionally be provided for overriding an existing channel or a channel request based on user preferences and/or business rules. For example, the customization engine may select a video feed that has a more reliable higher quality video signal, select an RF-delivered video feed to reduce bandwidth allocations over an IP-delivery network, select a video feed based on available interactive services associated with the video feed, etc.

The details of one or more aspects are set forth in the accompanying drawings and description below. Other features and advantages will be apparent from a reading of the following detailed description and a review of the associated drawings. It is to be understood that the following detailed description is explanatory only and is not restrictive of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features, aspects, and advantages of the present disclosure will become better understood by reference to the following figures, wherein like reference numbers indicate like elements throughout the several views:

FIG. 1 is a block diagram of an example environment in which a system of the present disclosure can be implemented;

FIG. 2 is a block diagram showing components of an example integrated video feed system according to an embodiment;

FIG. 3A is an illustration of an example electronic programming guide including a collective listing of video content programs available to the subscriber from a plurality of video content feed providers;

FIG. 3B is an illustration of an example recommendation menu including a collective listing of recorded video content programs from a plurality of video content feed providers;

FIG. 4 is a flow diagram depicting more detailed stages of an example process for combining video content feeds and integrating services according to an embodiment;

FIG. 5 is a block diagram illustrating example physical components of a computing device or system with which embodiments may be practiced;

FIGS. 6A and 6B are block diagrams illustrating example physical components of a suitable mobile computing environment with which aspects of the present disclosure can be practiced; and

FIG. 7 is a block diagram illustrating components of a cable services system architecture providing an example operating environment according to aspects of the present disclosure.

DETAILED DESCRIPTION

Aspects of the present disclosure enable combining a plurality of video feeds of various modulation formats and from a variety of sources for providing a unified interface and an extension of services across the plurality of video feeds. FIG. 1 is a block diagram of an example environment

3

100 in which a system of the present disclosure can be implemented. A plurality of video content feed providers **102a-n** (generally **102**) may provide video content broadcasts to a subscriber over a variety of networks **104a-n** (generally **104**). For example, the video content feed providers **102** may encode and modulate video content/programming data (e.g., video data, audio data, metadata) and services onto radio frequency (RF) carriers and combine the RF carriers into an electrical signal that is transmitted over a network **104** to a subscriber premises **106**. According to an aspect, the video content feeds may be encoded and transmitted according to various modulation techniques, such as quadrature amplitude modulation (QAM), advanced television standards committee (ATSC) standards, etc. In some examples, a video content feed may include internet protocol television (IPTV) content that may be communicated by one or more networks **104** using Data over Cable Service Interface Specification (DOCSIS) standards, Passive Optical Network (PON) standards, etc. As an example, a first video content feed provider **102a** may include a cable television (CATV) service provider configured to transmit a video content broadcast comprising QAM channels over a hybrid fiber coax (HFC) transmission network **104a** to a subscriber premises **106**. As another example, a second video content feed provider **102b** may include a terrestrial television broadcaster configured to transmit another video content broadcast comprising ATSC channels over the air (OTA) **104b** that are received by an antenna at the subscriber premises **106**. As another example, a third video content feed provider **102c** may include a satellite service provider configured to transmit satellite broadcast channels via a communications satellite that are received by a satellite antenna at the subscriber premises **106**. As another example, a fourth video content feed provider **102d** may include an IPTV service provider configured to transmit IPTV channels via a broadband network **104d** using the Internet Protocol.

According to an aspect, the environment **100** may include an integrated video feed system **110** located at least in part at the subscriber premises **106** that is configured to receive a plurality of video content broadcast feeds, generate a combined data feed comprising video content signals included in the plurality of video content feeds, identify and decode the video content signals, obtain additional data associated with each of the plurality of video content feeds, provide a unified interface for displaying an aggregation of data and services (e.g., recommendations, favorites, recording, closed captioning, parental controls) associated with the plurality of video content feeds, and to provide requested video content included in the plurality of video content broadcast feeds for playback on a display device **108**. For example, the integrated video feed system **110** may be operatively connected to a local network at the premises **106**, where video programming content provided by the plurality of video content feed providers **102** may be delivered to television sets, computers, gaming devices, and other devices that may include or be operatively connected to the display device **108**.

In some examples, the integrated video feed system **110** may be configured to communicate with one or more servers **116** to obtain channel lineups/schedules and other information corresponding to the video content channels offered by the plurality of video content feed providers **102** and provide an aggregated or collective electronic program guide (EPG) for display on the operatively connected display device **108**. The aggregated/collective EPG may include scheduling information of each of the video content channels provided by the plurality of video content feed providers **102**, and

4

may further include information (e.g., descriptions, ratings) about the various programs included in the lineups/schedules. In some examples, the aggregated/collective EPG may include signal quality information.

In some examples, the integrated video feed system **110** is configured to extend one or more services (e.g., content recording, recommendations, favorites, user preferences, business rules, closed captioning, parental controls) across the plurality of video content feeds. In some examples, a first video content feed may not include a particular service offered by a second video content feed provider. By combining the video content feeds, aspects may advantageously extend the service offered by the second video content feed provider to the first video content feed. As an example, recording functionalities may be provided for video content included in any of the plurality of video content feeds. By providing a combined video content feed, the integrated video feed system **110** may enable a local or cloud-based digital video recorder (DVR) to record a video program included in one of the plurality of video content feeds provided by the various video content feed providers **102**. In some examples, the DVR may be configured to record more than one video program included in the plurality of video content feeds at a time.

In some examples, the EPG may include a menu option for providing a listing of integrated recommendations, wherein the integrated recommendations may include a listing of recommended channels or video programs included in the plurality of video content feeds based on specified and/or determined user preferences. For example, user preferences may be determined based on a user's viewing history of video programs included in one or more of the plurality of video content feeds, and the recommended channels or video programs may be based on matching the user preferences to one or more channels or programs included in the plurality of video content feeds. That is, a recommendation may include a recommended video program provided in a first data feed from a first video content feed provider **102a** based on the user's viewing history of another video program provided in a second video content feed from a second video content feed provider **102b**. This may advantageously use the user's combined viewing histories to provide better/more relevant recommendations and to provide a single easily-navigable interface to view recommendations across all the available video content feeds. As another example, the EPG may include a menu option for providing a listing of favorites, which may comprise one or more video channels or video programs that are selected as favorites by the user or determined to be favorites based on the user's viewing history. The listing of favorites may be configured to include, in a single easily-navigable interface, favorite channels or programs across the plurality of video content feeds. Other extended services for the plurality of video content feeds may be additionally or alternatively provided.

Each component in the example network environment **100** may include one or more computing devices such as servers, workstations, set top boxes, desktop computers, laptop computers, tablets, mobile phones, smart devices, gaming devices, etc., and one or more databases. Further details of the computing devices and variations thereof can be found in FIGS. 5, 6A, 6B, and 7.

With reference now to FIG. 2, a conceptual illustration of an example embodiment of the integrated video feed system **110** is provided. As should be understood by those skilled in the art, one or more of the components included in the integrated video feed system **110** can be integrated or

5

provided in any combination of separate systems, wherein FIG. 2 shows only one example. According to an aspect, the integrated video feed system 110 may include a multiplexer 202 operative or configured to receive a plurality of video content broadcast feeds 210a-n (generally 210 and sometimes referred to herein as video content feeds) from a plurality of video content feed providers 102, to generate a combined video content feed 212 comprising video data, audio data, and any related data (e.g., control information) corresponding to channels within each of the associated video content broadcast feeds 210, and to provide the combined video content feed 212 as output to a set-top box (STB) 204 located at the customer premises.

According to an aspect, the multiplexer 202 may comprise a plurality of input pins operatively connected to the various transmission networks 104, wherein the plurality of input pins and/or fiber terminals are configured to receive the plurality of video content feeds 210 transmitted to the subscriber premises 106 via the various transmission networks 104. For example, each of the plurality of video content feeds 210 may correspond to different carrier signals that carry video data, audio data, and related data (e.g., control information) corresponding to channels within the video content broadcast feed provided by a video content feed provider 102. The multiplexer 202 may further comprise an output pin and/or fiber terminal operatively connected to the STB 204, wherein the output pin is configured to output the combined video content feed 212 to the STB 204 via a transmission line. In some examples, the multiplexer 202 may be connected to the STB 204 via a conveying medium, such as a coaxial cable line 214.

According to an aspect, the multiplexer 202 may comprise a demodulator 206 operative or configured to extract, from a video content broadcast feed 210, video content/programming data (e.g., video data, audio data, metadata) from the carrier signals that are used to transport the video content through a transmission network 104. For example, depending on the type of video content broadcast feed 210 (e.g., a satellite broadcast feed or OTA feed), the demodulator 206 may demodulate the feed for allowing the video content data signals to be combined with video content data signals included in other received video content broadcast feeds (e.g., a CATV QAM feed, an IPTV feed). When the extracted video content signals are transmitted to and processed by the STB 204, images corresponding to the video content signals may be displayed on a display device 108 operatively connected to the STB 204 and audio corresponding to the video content signals may be played by a speaker included in or operatively connected to the a display device 108 or STB 204.

According to another aspect, the multiplexer 202 further comprises a combiner 208 operative or configured to receive the extracted video content signal from the demodulator 206 and combine the video content signals carried in each of the plurality of video data broadcast feeds 210 into a combined video content feed 212 that is transmitted to the STB 204. For example, the combiner 208 may be configured to combine the various frequency bands of the plurality of video data broadcast feeds 210 into a combined signal that is transmitted to the STB 204 via a conveying medium, such as coaxial cable 214. In some cases, different received signals may use and overlap a same frequency band. Accordingly, in some examples, the combiner 208 may be configured to select a 'better' signal based on the signal-to-noise ratio (SNR) of the received signals; or, in other examples, the combiner 208 may include a modulator configured to move one of the overlapping signals to another frequency

6

band. In some examples, the combiner 208 may be configured to store or access customer behavior data that enables the combiner to determine, based on past customer behavior, a preferred signal; wherein the modulator may move the other signal to another frequency band. Any frequency band changes may be communicated to the EPG engine 218 (described below). In an alternative embodiment, the demodulator 206 may include a plurality of demodulators, the STB 204 may include a plurality of decoders 230, and the resulting AV stream from the multiplexer 202 may be delivered to the STB based on digital switching. In another alternative embodiment, the multiplexer 202 may include an analog switch configured to switch between video content broadcast feeds 210 such that only one input is connected to the demodulator 206 at a time.

The STB 204 is illustrative of a computing device having at least one processor, memory, and an input/output mechanism. According to an aspect, the STB 204 is configured to receive the combined video content feed signal 212 output by the multiplexer 202 and received via the coaxial cable 214, and to convert video content signals included in the combined video content feed 212 into a form that can be displayed on a television screen or other display device 108.

According to an aspect, the STB 204 may comprise a feed identifier 216 illustrative of a software application, module, or computing device operative or configured to parse the combined video content feed 212 to identify the various video content data signals within the received combined video content feed 212. For example, the feed identifier 216 may be operative to determine the types of feeds and frequency modulation techniques that are associated with each of the plurality of video content broadcast feeds 210 included in the combined video content feed 212. For example, the determination may be made based on one or more of: metadata provided by the multiplexer 202, the frequency bands used, additional information passed through the multiplexer 202 from the video content broadcast feeds 110, and service provider (i.e., video content feed provider 102) channel information that may be stored on a server 116 and accessed by the feed identifier 216.

According to an aspect, the STB 204 further comprises an electronic programming guide (EPG) engine 218 illustrative of a software application, module, or computing device operative or configured to, based on each of the determined types of video content broadcast feeds 210 included in the combined video content feed 212 (e.g., as determined by the feed identifier 216), request programming guide data and metadata from one or more data source servers 116. For example, the programming guide data may comprise information about the video content channels included in the video content broadcast feeds 210, such as channel numbering, frequencies of the channels, and associated metadata. The one or more data source servers 116 may be or be associated with each of the one or more video content feed providers 102, or may be a centralized scheduling information provider that receives programming scheduling information from each of the one or more video content feed providers 102 and provides programming scheduling information associated with the one or more video content feed providers 102 to a requestor (e.g., the EPG engine 218 of the integrated video feed system 110).

According to an aspect, the EPG engine 218 is further operative or configured to generate an EPG for display on a television screen or other display device 108. For example, the EPG may include a menu of programming scheduling information corresponding to the plurality of video content broadcast feeds 210 included in the combined video content

feed **212**. That is, the EPG may provide a unified interface for displaying an aggregation of data associated with the plurality of video content broadcast feeds **210**. In various examples, the EPG is an interactive EPG. For example, the EPG may be configured to enable a user to navigate scheduling information menus interactively, which may include selecting and discovering programming content by time, title, channel, or genre using an input device such as a keypad, computer keyboard, or television or STB remote control.

In some examples, the EPG may further include a recommendations menu that provides a common user interface for listing and enabling interaction with recommendations across the plurality of video content broadcast feeds **210**. The EPG engine **218** may be further operative or configured to include, in the recommendations menu, at least one recommendation including a recommended video content program or channel included in the plurality of video content broadcast feeds **210**. For example, the recommendation may be based on explicitly and/or implicitly defined user preferences, and may include content provided by any of the plurality of video content feed providers **102**. Implicitly defined user preferences may be determined based on the user's viewing history across the plurality of video content broadcast feeds **210**. By using the collective histories of the user's viewing behaviors, the recommendations determined for the user may be more relevant to him/her based on the user's collective viewing habits.

In some examples, the EPG may further include a favorites menu, wherein the EPG engine **218** may be further operative or configured to include, in the favorites menu, at least one video content program or channel that is explicitly selected as a favorite by the user or implicitly selected based on the user's viewing history. The favorites menu may include programs or channels provided by the plurality of video content feed providers **102**. As with the recommendations menu, the favorites menu provides a common user interface for listing and enabling interaction with favorites across the plurality of video content broadcast feeds **210**. In some examples, the EPG engine **218** may be further configured to apply one or more business rules when selecting favorite content items or recommended content items. The one or more business rules may be configured to select a content item for inclusion in the favorites menu or recommendations menu based on resolution, bitrate, bandwidth allocation, etc. For example, if a content item is provided by two sources, and if the content item provided by one source is 4K and the content item provided by the other source is 1080p30, then a business rule may be applied that automatically selects the 4K content item to include in the favorites or recommendations menu. As another example, if the resolutions are the same, a business rule may be applied that automatically selects the content item with a higher bitrate to accommodate higher image quality in the video output. The business rules may be configurable and may include additional or alternative types of business rules.

In some examples, the STB **204** further comprises or is operatively connected to a channel assigner **220** illustrative of a software application, module, or computing device operative or configured to assign channel numbers to channel frequencies used by the video content feed providers **102** to broadcast their video content broadcast feed **210**. In some examples, the channel assigner **220** may be operative or configured to assign virtual channel numbers. For example, virtual channel numbers that are assigned to the various channel frequencies may be displayed in the EPG corresponding to the channel frequency and programming content

broadcast on that frequency. Accordingly, if a same channel number is assigned by more than one video content feed provider **210** to more than one channel frequency used to broadcast the signals, one or more virtual channel numbers may be assigned to the signals and may override the provider-assigned channel numbers. The virtual channel numbers assigned by the channel assigner **220** may be provided to the EPG engine **218** for inclusion in the aggregated EPG.

In some examples, the STB **204** may further comprise or be operatively connected to a customization engine **222** illustrative of a software application, module, or computing device operative or configured to apply one or more customization rules **224** (e.g., stored in a local or cloud-based rules data store) as part of selecting content for inclusion or preferential/prominent display in the EPG, assigning virtual channel numbers, and/or requesting a channel corresponding to a user selection. For example, based on one or more customization rules **224**, the customization engine **222** may determine to give preference to one particular video content signal over another. For example, the customization engine **222** may be configured to give preference to a video content feed with a better signal and that may provide a higher video quality resolution bit rate. Or as another example, the customization engine **222** may be configured to give preference to a video content feed that conserves bandwidth in an IP-delivery network.

In some examples, as part of giving preference to a particular video content signal over another, the customization engine **222** may assign or instruct the channel assigner **220** to assign a virtual channel number to the preferred video content signal, while suppressing the other (not-preferred) video content signal. In other examples, the customization engine **222** may be configured to apply customization rules **224** after a selection to view a certain video content program. For example, the user may select to view a first video content program provided by a first video content broadcast feed **210a**, and if the customization engine **222** makes a determination to give preference to another broadcast of the video content program, the customization engine **222** may be operative or configured to instruct the multiplexer **202** to send the preferred video content broadcast feed instead of the selected first video content broadcast feed **210a**.

The one or more customization rules **224** may include business rules and/or user preference rules. The user preference rules may be explicitly defined (e.g., the user selects certain channels or content preferences) or implicitly defined (e.g., the user's channel or content preferences are determined based on the user's historical usage patterns). The business rules may correspond to quality of service rules. As an example, given two different video content signals that may include the same or similar video programming content, the customization engine **222** may give preference to one video content signal over the other based on the quality or strength of the signal, higher bitrate, higher resolution, if a feed utilizes less bandwidth, power, or memory, etc. As another example, the customization engine **222** may give preference to one video content signal over another based on additional services that may be provided with the video content signal. For example, the preferred video content signal may include interactive functionalities that the other video content signal may not include. Examples of interactive functionalities may include, but are not limited to: selectable hotspots that reveal other content or link to a web page, customizable views that allow the user to drag the screen within a video frame, branches that allow the user to control storylines and/or customize the content they see,

data inputs for enabling user input, quizzes or other gaming functionalities, and other interactive functionalities.

In some examples, the customization engine **222** may be operative or configured to give preference to certain data (e.g., audio data or video data) in one video content signal over certain data in another video content signal. For example based on one or more customization rules **224**, the audio data of a first video content signal associated with particular video programming may be preferred and assigned a virtual channel number, and the video data of a second video content signal associated with the same or similar video programming may be preferred and assigned the same virtual channel number such that tuning to the virtual channel number may include tuning to two different video content feeds and filtering out a particular signal (e.g., video or audio) of each feed, and thus provide a combination of the video and audio data of the two signals. As can be appreciated, that may enable the user to watch video of the second video content broadcast feed **210** while listening to audio of the first video content broadcast feed **210**.

In some examples, the EPG engine **218** is operative or configured to interface a local or cloud digital video recorder (DVR). For example, the user may be enabled to select a video content program included in the EPG to record and view at a later time. Additionally, recorded content from any of the video content feed providers **102** may be included in a common recordings menu user interface. For example, video content programming that is provided by one or more of the plurality of video content feed providers **102** and recorded may be listed in an integrated user interface of the EPG that includes a listing of recorded content.

According to another aspect, the feed identifier **216** may be further configured to split the combined video content feed **212** and deliver particular video content signals to one of: a QAM tuner **226**, or an IPTV interface **228**, then to a decoder **230** based on the type of signal. For example, based on a selection of a particular channel included in the combined video content feed **212**, a signal may be passed to the multiplexer **202** to pass the corresponding video content signals to the STB **204**. If a recording is occurring, the multiplexer **202** may be configured to allow for the signal associated with the recording and an additional video content signal to pass through to the STB **204**. If the video content signals are QAM signals, the QAM signals may be passed to the QAM tuner **226** to be processed. For example, the QAM tuner **226** may tune to a requested QAM channel. In some examples, the QAM tuner **226** may be further operative or configured to enable various entitlements based on the user's subscription (e.g., with the CATV service provider). The IPTV interface **228** may be operative or configured to receive and decrypt IPTV video content signals according to appropriate IPTV protocols, and then pass the decrypted IPTV packets to the decoder **230** for processing. In some examples, if the video content signals are ATSC signals, the ATSC signals may be passed directly to the decoder **230** for processing. According to an aspect, the decoder **230** may be operative or configured to decode the received video content signals for the selected channel and convert the channel signal into a format that can be processed by the display device **108** (and/or speaker device) to properly output the video content to be displayed and audibly played. The decoder **230** may be further include or be operatively connected to a decryptor configured to decrypt encrypted signals. The decrypted signals may then be passed to the display device **108**.

According to another embodiment of the integrated video feed system **110**, in some examples, the multiplexer **202** may

be located at a node **232** in a transmission network **104**. For example, an HFC transmission network **104a** may extend from a head end of a CATV service provider (first video data feed provider **102a**) to the node **232**, where the node **232** may serve a plurality of subscribers in a service area. When the multiplexer **202** is located at a node **232**, video content broadcast feeds **210** may be passed from the subscriber premises **106** upstream to the multiplexer **202**, and the combined video content feed **212** may be passed to the customer premises STB **204** via a transmission medium, such as a coaxial cable **214** or other transmission media.

With reference now to FIG. 3A, an example EPG **302** is illustrated that provides, in a user interface, a collective listing of video content programs **308a-t** (generally **308**) available to the subscriber from a plurality of video content feed providers **102**. In some examples, the listing of video content programs **308** may be categorized by channel **304** or content feed provider. The channels **304** may include actual channel numbers (e.g., assigned by the video content feed providers **102**) and/or virtual channel numbers (e.g., channel numbers assigned by the STB **204**). In other examples, the listing of video content programs **308** may be categorized by genre or other category type. In some examples, the EPG **302** may include additional information, such as the video content feed provider **102** from where the channel is derived.

According to an aspect, one or more of the video content programs **308** included in the EPG **302** may be selected for inclusion or selected for preferential or prominent display in the EPG **302** based on customization rules **224**. For example, based on one or more customization rules **224** corresponding to user preferences and/or business rules (e.g., signal quality, signal strength, bandwidth usage) the customization engine **222** may determine that one video content program **308** may be more preferred than another video content program; and based on this determination, the more preferred video content program **308** may be displayed more prominently (e.g., position, size, effects, description) in the EPG **302** than the other video content program.

With reference now to FIG. 3B, an example recordings menu **310** is illustrated that provides, in a single user interface, a collective listing of recorded programs **312a-n** (generally **312**). For example, the recorded programs **312** may include programs broadcast by more than one of the plurality of video content feed providers **102**. In some examples, a particular video content program **308** may be selected to be recorded based on one or more customization rules **224**. That is, for example, the user may select to record a first video content program **308a**. Based on one or more customization rules **224** corresponding to user preferences and/or business rules, the customization engine **222** may determine that a second video content program **308b** may be more preferred than first video content program **308a**; and based on this determination, the more preferred video content program **308b** may be recorded. As described above, preference may be given based on quality of service (e.g., signal quality, signal strength, bandwidth usage), user preferences, additional services, etc.

FIG. 4 is a flow chart depicting general stages of an example process or method **400** for combining video content feeds and integrating services according to an embodiment. The method **400** starts at OPERATION **402** and proceeds to OPERATION **404**, where a plurality of video content broadcast feeds **210** from a plurality of video content feed providers **102** are received. For example, the method **400** may use the multiplexer **202** to receive the various video content broadcast feeds **210** via various transmission networks **104**.

11

At DECISION OPERATION 406, a determination may be made as to whether to demodulate a particular video content broadcast feed 210. For example, the determination may be made based on the broadcast feed 210 type. When a determination is made to demodulate a video content broadcast feed 210, at OPERATION 408, the feed may be passed to the demodulator 206 to extract video content data signals from carrier signals.

At OPERATION 410, demodulated video content broadcast feeds 210 and other feeds that may not need to be demodulated may be combined. For example, the method 400 may use the combiner 208 to combine the video content data signals to generate a combined video content feed 212.

At OPERATION 412, the combined video content feed 212 may be transmitted to the customer premises STB 204. For example, the combined video content feed 212 may be passed to the STB 204 via a coaxial cable 214.

At OPERATION 414, a determination may be made as to the types of video content broadcast feeds 210 that are included in the combined video content feed 212. For example, the method 400 may use the feed identifier 216 to make the determination. The determination may be based on information provided by the multiplexer 202 about the included video content broadcast feeds 210, from the cloud (e.g., server 116), frequency bands used, etc.

At OPERATION 416, a request may be made to obtain guide data and metadata from one or more data source servers 116. For example, the programming guide data may comprise information about the video content channels included in the video content broadcast feeds 210, such as channel numbering, frequencies of the channels, and associated metadata.

At OPTIONAL OPERATION 418, one or more customization rules 224 may be applied as part of selecting content for inclusion or preferential/prominent display in the EPG 302 and/or as part of assigning virtual channel numbers 304 to particular channel frequencies.

At OPERATION 420, a collective EPG 302 may be generated that includes scheduling information of each of the video content channels provided by the plurality of video content feed providers 102, and may further include information (e.g., descriptions, ratings) about the various programs 308 included in the lineups/schedules. According to an aspect, the EPG 302 may further include a recommendations menu comprising a listing of recommended channels or video programs included in the plurality of video content feeds 210 based on specified and/or determined user preferences. According to another aspect, the EPG 302 may further include a favorites menu comprising a listing of favorite channels or video programs included in the plurality of video content feeds 210 based on user selections and/or specified and/or determined user preferences. According to another aspect, the EPG 302 may further include a recordings menu 310 comprising a collective listing of recorded programs 312, wherein the recorded content may be provided by more than one of the plurality of video content feed providers 102.

At OPERATION 422, a selection of a video content program 308 may be received. For example, the user may select a video content program 308 listed in the EPG 302 to view.

At OPERATION 424, a determination may be made as to a preferred video content feed 210 corresponding to the selected video content program 308 based one or more customization rules 224. That is, based on user-specified preferences, user preferences determined based on user viewing behaviors, and/or business rules, the method 400

12

may use the customization engine 222 to select one particular video content broadcast feed 210 over another feed. For example, the determination/selection may be based on quality of service, additional services provided with a particular feed, etc. According to an aspect, a preferred video content feed 210 may be comprised of more than one feed. As an example, a video portion of one video content feed 210 and an audio portion of another video content feed 210 may be preferably selected for playback of a particular video content program 308.

At OPERATION 426, a request for the video content broadcast feed(s) 210 corresponding to the preferred feeds determined by the customization engine 222 may be sent to the multiplexer 202.

At OPERATION 428, the multiplexer 202 may pass the requested video content broadcast feed(s) 210 to the STB 204, where the one or more feeds may be processed for display and audible play. For example, the STB 204 may decode video content broadcast feed(s) 210 and tune accordingly based on the delivery mechanism of the feed(s).

At OPERATION 430, the video content program 308 may be displayed on the display device 108 and played via a speaker. The method 400 ends at OPERATION 498.

FIG. 5 is a block diagram illustrating example physical components of a computing device or system 500 (e.g., system 110) with which embodiments may be practiced. It should be appreciated that in other embodiments, different hardware components other than those illustrated in the example of FIG. 5 may be used. Computing devices may be implemented in different ways in different embodiments. For instance, in the example of FIG. 5, the computing device 500 includes a processing system 504, memory 502, a network interface card 506 (wired and/or wireless), a secondary storage device 508, an input device 510, a video interface 512, a display unit 514, and a communication medium 517. In other embodiments, the computing device 500 may be implemented using more or fewer hardware components (e.g., a video interface, a display unit, or an input device) or in combination with other types of computer systems 526 and program modules.

The memory 502 includes one or more computer-readable storage media capable of storing data and/or computer-executable instructions. Memory 502 may store the computer-executable instructions that, when executed by a processor or processing unit of the processing system 504, cause operations, such as the operations described above with respect to FIG. 4) to combine video content feeds and integrate services. In various embodiments, the memory 502 is implemented in various ways. For example, the memory 502 can be implemented as various types of computer-readable storage media. Example types of computer-readable storage media include, but are not limited to, solid state memory, flash memory, dynamic random access memory (DRAM), double data rate synchronous dynamic random access memory (DDR SDRAM), DDR2 SDRAM, DDR3 SDRAM, read-only memory (ROM), reduced latency DRAM, electrically-erasable programmable ROM (EEPROM), and other types of devices and/or articles of manufacture that store data.

The term computer-readable storage medium may also refer to devices or articles of manufacture that store data and/or computer-executable instructions readable by a computing device. The term computer-readable storage media encompasses volatile and nonvolatile, removable and non-removable media implemented in various methods or technologies for storage and retrieval of information. Such

13

information can include data structures, program modules, computer-executable instructions, or other data.

The processing system **504** includes one or more processing units (e.g., one or more processors), which may include tangible integrated circuits that selectively execute computer-executable instructions. In various embodiments, the processing units in the processing system **504** are implemented in various ways. For example, the processing units in the processing system **504** can be implemented as one or more processing cores. In this example, the processing system **504** can comprise one or more microprocessors. In another example, the processing system **504** can comprise one or more separate microprocessors. In yet another example embodiment, the processing system **504** can comprise Application-Specific Integrated Circuits (ASICs) that provide specific functionality. In yet another example, the processing system **504** provides specific functionality by using an ASIC and by executing computer-executable instructions.

The computing device **500** may be enabled to send data to and receive data from a communication network via a network interface card **506**. In different embodiments, the network interface card **506** is implemented in different ways, such as an Ethernet interface, a token-ring network interface, a fiber optic network interface, a wireless network interface (e.g., WIFI, Wi-Max, etc.), or another type of network interface. The network interface may allow the device to communicate with other devices, such as over a wireless network in a distributed computing environment, a satellite link, a cellular link, and comparable mechanisms. Other devices may include computer device(s) that execute communication applications, storage servers, and comparable devices.

The secondary storage device **508** includes one or more computer-readable storage media, and may store data and computer-executable instructions not directly accessible by the processing system **504**. That is, the processing system **504** performs an I/O operation to retrieve data and/or computer-executable instructions from the secondary storage device **508**. In various embodiments, the secondary storage device **508** can be implemented as various types of computer-readable storage media, such as by one or more magnetic disks, magnetic tape drives, CD-ROM discs, DVD-ROM discs, BLU-RAY discs, solid state memory devices, and/or other types of computer-readable storage media.

The input device **510** enables the computing device **500** to receive input from a user. Example types of input devices include, but are not limited to, keyboards, mice, trackballs, stylus input devices, key pads, microphones, joysticks, touch-sensitive display screens, and other types of devices that provide user input to the computing device **500**.

The video interface **512** outputs video information to the display unit **514**. In different embodiments, the video interface **512** is implemented in different ways. For example, the video interface **512** is a video expansion card. In another example, the video interface **512** is integrated into a motherboard of the computing device **500**. In various embodiments, the display unit **514** can be an LCD display panel, a touch-sensitive display panel, an LED screen, a projector, a cathode-ray tube display, or another type of display unit. In various embodiments, the video interface **512** communicates with the display unit **514** in various ways. For example, the video interface **512** can communicate with the display unit **514** via a Universal Serial Bus (USB) connector, a VGA connector, a digital visual interface (DVI) connector, an

14

S-Video connector, a High-Definition Multimedia Interface (HDMI) interface, a DisplayPort connector, or another type of connection.

The communications medium **517** facilitates communication among the hardware components of the computing device **500**. In different embodiments, the communications medium **517** facilitates communication among different components of the computing device **500**. For instance, in the example of FIG. 5, the communications medium **517** facilitates communication among the memory **502**, the processing system **504**, the network interface card **506**, the secondary storage device **508**, the input device **510**, and the video interface **512**. In different embodiments, the communications medium **517** is implemented in different ways, such as a PCI bus, a PCI Express bus, an accelerated graphics port (AGP) bus, an InfiniBand® interconnect, a serial Advanced Technology Attachment (ATA) interconnect, a parallel ATA interconnect, a Fiber Channel interconnect, a USB bus, a Small Computing system Interface (SCSI) interface, or another type of communications medium.

The memory **502** stores various types of data and/or software instructions. For instance, in the example of FIG. 5, the memory **502** stores a Basic Input/Output System (BIOS) **518**, and an operating system **520**. The BIOS **518** includes a set of software instructions that, when executed by the processing system **504**, cause the computing device **500** to boot up. The operating system **520** includes a set of software instructions that, when executed by the processing system **504**, cause the computing device **500** to provide an operating system that coordinates the activities and sharing of resources of the computing device **500**. The memory **502** also stores one or more application programs or program code **522** that, when executed by the processing system **504**, cause the computing device **500** to provide applications to users. The memory **502** also stores one or more utility programs **524** that, when executed by the processing system **504**, cause the computing device **500** to provide utilities to other software programs.

Embodiments may be used in combination with any number of computer systems, such as in server environments, desktop environments, laptop or notebook computer systems, multiprocessor systems, micro-processor based or programmable consumer electronics, networked PCs, mini computers, main frame computers and the like. Embodiments may be utilized in various distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network in a distributed computing environment, and where program code may be located in local and/or remote memory storage (e.g., memory and/or disk(s)).

All system components described herein may be communicatively coupled via any method of network connection known in the art or developed in the future including, but not limited to wired, wireless, modem, dial-up, satellite, cable modem, Digital Subscriber Line (DSL), Asymmetric Digital Subscribers Line (ASDL), Virtual Private Network (VPN), Integrated Services Digital Network (ISDN), X.25, Ethernet, token ring, Fiber Distributed Data Interface (FDDI), IP over Asynchronous Transfer Mode (ATM), Infrared Data Association (IrDA), wireless, WAN technologies (T1, Frame Relay), Point-to-Point Protocol over Ethernet (PPoE), etc. including any combination thereof.

FIGS. 6A-6B illustrate a suitable mobile computing device **600** or environment, for example, a mobile computing device or smart phone, a tablet personal computer, a laptop computer, or other client device with which aspects

15

can be practiced. The mobile computing device **600** is illustrative of any suitable device operative to send, receive and process wireless communications. Referring now to FIG. **6A**, a display screen **605** is operative for displaying a variety of information such as information about incoming and outgoing communications, as well as, a variety of data and displayable objects, for example, text, alphanumeric data, photographs, and the like.

Data input to the mobile computing device **600** can be performed via a variety of suitable means, such as, touch screen input via the display screen **605**, keyboard or keypad input via a data entry area **610**, key input via one or more selectable buttons or controls **615**, voice input via a microphone **618** disposed on the mobile computing device **600**, photographic input via a camera **625** functionality associated with the mobile computing device **600**, or any other suitable input means. Data can be output via the mobile computing device **600** via any suitable output means, including but not limited to, display on the display screen **605**, audible output via an associated speaker **630** or connected earphone system, vibration module for providing tactile output, and the like.

Referring now to FIG. **6B**, operational unit **635** is illustrative of internal operating functionality of the mobile computing device **600**. A processor **640** is illustrative of a computer processor for processing incoming and outgoing data and communications and controlling operation of the device and associated software applications via a mobile computing device operating system. Memory **645** can be utilized for storing a device operating system, device programming, one or more stored applications, for example, mobile telephone applications, data processing applications, calculators, games, Internet browsing applications, navigation applications, acceleration applications, camera and/or video applications, etc.

Mobile computing device **600** can contain an accelerometer **655** for detecting acceleration, and can be used to sense orientation, vibration, and/or shock. Mobile computing device **600** can contain a global positioning system (GPS) system (e.g., GPS send/receive functionality) **660**. A GPS system **660** uses radio waves to communicate with satellites orbiting the Earth. Some GPS-enabled mobile computing devices use wireless-assisted GPS to determine a user's location, wherein the device uses orbiting GPS satellites in conjunction with information about the device's mobile phone signal. Radio functions **650** include all required functionality, including onboard antennae, for allowing the mobile computing device **600** to communicate with other communication devices and systems via a wireless network. Radio functions **650** can be utilized to communicate with a wireless or WIFI-based positioning system to determine a device location.

FIG. **7** is a block diagram illustrating a cable television services system **700** (hereafter referred to as "CATV") architecture providing an operating environment according to an aspect. According to aspects, one of the plurality of video content feed providers **102** may operate in the form of a CATV **700** as illustrated and described in FIG. **7**. As should be appreciated, a CATV services system **700** is but one of various types of systems that can be utilized for providing an operating environment for providing supplemental content functionality described herein. Referring now to FIG. **7**, digital and analog video programming, information content and interactive television services are provided via a HFC network **104a** to a television set **716** for consumption by a cable television/services system customer. As is known to those skilled in the art, HFC networks **104a** combine both fiber optic cable lines and coaxial cable lines. Typically, fiber

16

optic cable lines run from the cable head end **720** to neighborhoods of subscribers. Coaxial cable lines run from the optical fiber feeders to each customer or subscriber.

The CATV system **700** is in the form of a distributed client-server computing system for providing video and data flow across the HFC network **104a** between server-side services providers (e.g., cable television/services providers), such as video content feed provider **102a**, via a server-side head end **720** and a client-side customer via a set-top box (STB) **204** functionally connected to a customer receiving device, such as the television set **716**. The functionality of the HFC network **104a** allows for efficient bidirectional data flow between the set-top box **204** and an application server **740** of the server-side head end **720**. As is understood by those skilled in the art, modern CATV systems **700** can provide a variety of services across the HFC network **104a** including traditional digital and analog video programming, telephone services, high speed Internet access, video-on-demand, and services.

On the client side of the CATV system **700**, digital and analog video programming and digital and analog data are provided to the customer television set **716** via the STB **204**. Interactive television services that allow a customer to input data to the CATV system **700** likewise are provided by the STB **204**. As illustrated in FIG. **7**, the STB **204** is a multipurpose computing device having a computer processor, memory, and an input/output mechanism. The input/output mechanism receives input from server-side processes via the HFC network **104a** and from customers via input devices such as a remote control device **728**, keyboard **730**, or other computing device, such as a tablet/slate computer, smart phone, etc. The remote control device **728** and the keyboard **730** can communicate with the STB **204** via a suitable communication transport such as the infrared connection **732**. The remote control device **728** can include a biometric input module **729**. The STB **204** also includes a video processor for processing and providing digital and analog video signaling to the television set **716** via a cable communication transport **734**. A multi-channel tuner is provided for processing video and data to and from the STB **204** and the server-side head end **720**, described below.

The STB **204** also includes an operating system **722** for directing the functions of the STB **204** in conjunction with a variety of client applications **725**. For example, if a client application **725** requires a news flash from a third-party news source to be displayed on the television **716**, the operating system **722** can cause the graphics functionality and video processor of the STB **204**, for example, to output the news flash to the television **716** at the direction of the client application **725** responsible for displaying news items.

Because a variety of different operating systems **722** can be utilized by a variety of different brands and types of set-top boxes **204**, a middleware layer **724** can be provided to allow a given software application to be executed by a variety of different operating systems. According to an embodiment, the middleware layer **724** can include a set of application programming interfaces (APIs) that are exposed to client applications and operating systems **722** that allow client applications **725** to communicate with the operating systems **722** through common data calls understood via the API set. As described below, a corresponding middleware layer **742** is included on the server side of the CATV system **700** for facilitating communication between the server-side application server and the client-side STB **204**. The middleware layer **742** of the server-side application server and the middleware layer **724** of the client-side STB **204** can format

data passed between the client side and server side according to the Extensible Markup Language (XML).

According to one aspect, the STB **204** passes digital and analog video and data signaling to the television **716** via a one-way communication transport **734**. According to other aspects, two-way communication transports can be utilized, for example, via high definition multimedia (HDMI) ports. The STB **204** can receive video and data from the server side of the CATV system **700** via the HFC network **104a** through a video/data downlink and data via a data downlink. According to an aspect, at least a portion of the integrated video feed system **110** (e.g., the multiplexer **202**) may be operatively positioned between the HFC network **104a** and the STB **204**. The STB **204** can transmit data from the client side of the CATV system **700** to the server side of the CATV system **700** via the HFC network **104a** via one data uplink. The video/data downlink is an “in band” downlink that allows for digital and analog video and data signaling from the server side of the CATV system **700** through the HFC network **104a** to the STB **204** for use by the STB **204** and for distribution to the television set **716**. As is understood by those skilled in the art, the “in band” signaling space operates at a relative high frequency, e.g., between 54 and 1000 megahertz. The signaling space is generally divided into 6 megahertz channels in which can be transmitted as a single analog signal or a greater number (e.g., ten) of digital signals.

The data downlink and the data uplink, illustrated in FIG. 7, between the HFC network **104a** and the set-top box **204** comprise “out of band” data links. As is understood by those skilled in the art, the “out of band” frequency range is generally at a lower frequency than “in band” signaling. For example, the “out of band” frequency range can be between zero and 54 megahertz. Data flow between the STB **204** and the server-side application server **740** is typically passed through the “out of band” data links. Alternatively, an “in band” data carousel can be positioned in an “in band” channel into which a data feed can be processed from the application server **740** through the HFC network **104a** to the STB **204**. Operation of data transport between components of the CATV system **700**, described with reference to FIG. 7, is well known to those skilled in the art.

Referring still to FIG. 7, the head end **720** of the CATV system **700** is positioned on the server side of the CATV system and includes hardware and software systems responsible for originating and managing content for distributing through the HFC network **104a** to client-side STBs **204** for presentation to customers. As described above, a number of services can be provided by the CATV system **700**, including digital and analog video programming, interactive television services, telephone services, video-on-demand services, targeted advertising, and/or provision of supplemental content.

The application server **740** can be configured as a computing system operative to assemble and manage data sent to and received from the STB **204** via the HFC network **104a**. As described above, the application server **740** includes a middleware layer **742** for processing and preparing data from the head end **720** of the CATV system **700** for receipt and use by the client-side STB **204**. For example, the application server **740** via the middleware layer **742** can obtain supplemental content from third-party services **746** via the Internet **744** for transmitting to a customer through the HFC network **104a**, the STB **204**, and recording by a local or remote DVR. For example, content metadata from a third-party content provider service can be downloaded by the application server **740** via the Internet **744**. When the

application server **740** receives the downloaded content metadata, the middleware layer **742** can be utilized to format the content metadata for receipt and use by the STB **204**. Therefore, content metadata can be sent and categorized based on the availability to the customer’s program guide data.

According to one embodiment, data obtained and managed by the middleware layer **742** of the application server **740** is formatted according to the Extensible Markup Language and is passed to the STB **204** through the HFC network **104a** where the XML-formatted data can be utilized by a client application **725** in concert with the middleware layer **724**, as described above. As should be appreciated by those skilled in the art, a variety of third-party services data **746**, including news data, weather data, sports data and other information content can be obtained by the application server **740** via distributed computing environments such as the Internet **744** for provision to customers via the HFC network **104a** and the STB **204**.

According to aspects, the application server **740** obtains customer support services data, including billing data, information on customer work order status, answers to frequently asked questions, services provider contact information, and the like from data services **726** for provision to the customer via an interactive television session. The data services **726** include a number of services operated by the services provider of the CATV system **700** which can include profile and other data associated with a given customer.

A billing system **762** can include information such as a customer’s name, street address, business identification number, Social Security number, credit history, and information regarding services and products subscribed to by the customer. According to embodiments, the billing system **762** can also include billing data for services and products subscribed to by the customer for bill processing, billing presentment and payment receipt. An authentication system **766** can include information such as secure user names, subscriber profiles, subscriber IDs, and passwords utilized by customers for access to network services. A customer information database **768** can include general information about customers such as place of employment, business address, business telephone number, and demographic information such as age, gender, educational level, and the like. The customer information database **768** can also include information on pending work orders for services or products ordered by the customer. The customer information database **768** can also include general customer information such as answers to frequently asked customer questions and contact information for various service provider offices/departments. As should be understood, this information can be stored in a variety of disparate databases operated by the cable services provider.

Referring still to FIG. 7, web services system **750** is illustrated between the application server **740** and the data services **726**. According to aspects, web services system **750** serves as a collection point for data requested from each of the disparate data services systems comprising the data services **726**. According to aspects, when the application server **740** requires customer services data from one or more of the data services **726**, the application server **740** passes a data query to the web services system **750**. The web services system **750** formulates a data query to each of the available data services systems for obtaining any required data for a requesting customer as identified by a set-top box identification associated with the customer. The web services system **750** serves as an abstraction layer between the various data services systems and the application server **740**.

19

That is, the application server **740** is not required to communicate with the disparate data services systems, nor is the application server **740** required to understand the data structures or data types utilized by the disparate data services systems. The web services system **750** is operative to communicate with each of the disparate data services systems for obtaining necessary customer data. The customer data obtained by the web services system is assembled and is returned to the application server **740** for ultimate processing via the middleware layer **742**, as described above. As should be understood by those skilled in the art, the disparate systems **750**, **762**, **766**, **768** can be integrated or provided in any combination of separate systems, wherein FIG. 7 shows only one example.

Aspects, for example, are described above with reference to block diagrams and/or operational illustrations of methods, systems, and computer program products according to embodiments. The functions/acts noted in the blocks can occur out of the order as shown in any flowchart or described herein. For example, two processes shown or described in succession can in fact be executed substantially concurrently or the blocks can sometimes be executed in the reverse order, depending upon the functionality/acts involved.

While certain embodiments have been described, other embodiments may exist. Furthermore, although embodiments have been described as being associated with data stored in memory and other storage mediums, data may also be stored on or read from other types of computer-readable storage media. Further, the disclosed processes may be modified in any manner, including by reordering and/or inserting or deleting a step or process, without departing from the embodiments.

The foregoing description has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the embodiments to the precise forms disclosed. Many modifications and variations are possible in light of the above teaching. It is intended that the scope of the invention be limited not with this detailed description, but rather by the claims appended hereto.

We claim:

1. A system for providing a combined video content feed, the system comprising:
 - a multiplexer located at a customer premises comprising:
 - a plurality of input pins to receive a plurality of video content feeds, the received plurality of video content feeds comprising at least two different video content feed types;
 - a demodulator to demodulate one or more of the received plurality of video content feeds according to the feed type of each video content feed;
 - a combiner to combine the demodulated plurality of video content feeds into a combined video content feed; and
 - an output pin to output the combined video content feed; and
 - a set-top box (STB) coupled to the output pin of the multiplexer, wherein the STB is located at the customer premises, and wherein the STB is configured to:
 - receive, via the output pin of the multiplexer, the combined video content feed;
 - identify each of the plurality of video content feeds within the combined video content feed;
 - request guide data for each of the identified plurality of video content feeds from one or more data source servers;
 - receive the requested guide data;
 - combine the received guide data into an aggregated electronic programming guide;

20

responsive to receiving a selection of a channel associated with a video content program via the aggregated electronic programming guide, request a video content feed corresponding to the channel;

receive the requested video content feed corresponding to the channel;

decode the received video content feed for a signal corresponding to the channel; and

provide the signal to a display device for viewing the received video content feed;

wherein the aggregated electronic programming guide comprises a user interface including a listing of favorite video content programs provided by at least two of the plurality of video content feed providers, wherein the favorite video content programs are determined based on user preferences associated with at least one of the plurality of video content feeds; and

wherein the user interface further includes a listing of recorded video content programs provided by at least two of the plurality of video content feed providers.

2. The system of claim 1, wherein the plurality of video content feeds are encoded and transmitted according to various modulation techniques.

3. The system of claim 1, wherein, prior to the request for the video content feed corresponding to the channel, the system is further configured to:

apply, via the STB, a customization rule to determine a preferred video content feed corresponding to the channel; and

based on the customization rule, request the preferred video content feed.

4. The system of claim 3, wherein the customization rule is associated with a business rule to select a preferred video content feed based on at least one of:

- signal quality;
- signal strength;
- video resolution; and
- bandwidth allocation.

5. The system of claim 3, wherein the customization rule is associated with one of:

- a user-selected user preference; or
- a user preference determined based on user viewing behavior.

6. The system of claim 3, wherein the preferred video content feed comprises at least two video content feeds.

7. The system of claim 1, wherein the user interface includes a listing of video content programs included in the plurality of video content feeds provided by a plurality of video content feed providers.

8. The system of claim 7, wherein the user interface includes a listing of recommended video content programs provided by at least two of the plurality of video content feed providers, wherein the recommended video content programs are determined based on user preferences associated with at least one of the plurality of video content feeds.

9. The system of claim 8, wherein the STB is further configured to apply one or more business rules when determining favorite video content programs or recommended video content programs.

10. The system of claim 8, wherein the STB is further configured to apply one or more customization rules when determining favorite video content programs or recommended video content programs.

11. The system of claim 1, wherein the received video content feed type comprises:

- a cable television (CATV) quadrature amplitude modulation (QAM) channel;

21

an advanced television standards committee (ATSC) channel;
 a satellite broadcast channels/signal;
 a terrestrial television (ATSC) channel over the air (OTV) radio waves; or
 an internet protocol television (IPTV) channel.

12. A method of providing a combined video content feed from a multiplexer to a set-top box (STB), comprising:
 coupling an output pin of the multiplexer with the STB, wherein the multiplexer includes:
 a plurality of input pins to receive a plurality of video content feeds, the plurality of video content feeds comprising at least two different video content feed types;
 a demodulator to demodulate one or more of the received plurality of video content feeds according to the feed type of each video content feed; and
 a combiner to combine the demodulated plurality of video content feeds into a combined video content feed;
 receiving, via the output pin of the multiplexer, the combined video content feed;
 identifying, via the STB, each of the plurality of video content feeds within the combined video content feed;
 requesting, via the STB, guide data for each of the identified plurality of video content feeds from one or more data source servers;
 receiving the requested guide data;
 combining, via the STB, the received guide data into an aggregated electronic programming guide;
 responsive to receiving a selection of a channel associated with a video content program via the aggregated electronic programming guide, requesting a video content feed corresponding to the channel;
 receiving the requested video content feed corresponding to the channel;
 decoding the received video content feed for a signal corresponding to the channel; and
 providing the signal to a display device for viewing the received video content feed,
 wherein combining the guide data into the aggregated electronic programming guide comprises providing a user interface including a listing of favorite video content programs provided by at least two of the plurality of video content feed providers, and wherein the favorite video content programs are determined based on user preferences associated with at least one of the plurality of video content feeds;
 wherein the user interface further includes a listing of recorded video content programs provided by at least two of the plurality of video content feed providers.

13. The method of claim 12, wherein, prior to requesting the video content feed corresponding to the channel:
 applying, via the STB, a customization rule to determine a preferred video content feed corresponding to the channel; and
 based on the customization rule, requesting the preferred video content feed.

14. The method of claim 12, wherein the user interface further includes a listing of video content programs included in the plurality of video content feeds provided by a plurality of video content feed providers.

15. The method of claim 12, wherein the user interface further includes a listing of recommended video content programs provided by at least two of the plurality of video content feed providers, and wherein the recommended video

22

content programs are determined based on user preferences associated with at least one of the plurality of video content feeds.

16. The method of claim 15, further comprising:
 applying one or more business rules when determining favorite video content programs or recommended video content programs.

17. The method of claim 12, wherein the received video content feed type comprises:
 a cable television (CATV) quadrature amplitude modulation (QAM) channel;
 an advanced television standards committee (ATSC) channel;
 a satellite broadcast channels/signal;
 a terrestrial television (ATSC) channel over the air (OTV) radio waves; or
 an internet protocol television (IPTV) channel.

18. A computer readable storage device that includes executable instructions which, when executed by a processor provide a combined video content feed, the instructions comprising:

using an output pin of a multiplexer coupled to a set-top-box (STB) to transmit video content to the STB, wherein the multiplexer includes:

a plurality of input pins to receive a plurality of video content feeds, the received plurality of video content feeds comprising at least two different video content feed types;

a demodulator to demodulate one or more of the received plurality of video content feeds according to the feed type of each video content feed; and

a combiner to combine the demodulated plurality of video content feeds into a combined video content feed;

receiving, via the output pin of the multiplexer, the combined video content feed;

identifying, via the STB, each of the plurality of video content feeds within the combined video content feed;

requesting, via the STB, guide data for each of the identified plurality of video content feeds within the combined video content feed;

receiving the requested guide data;

combining, via the STB, the received guide data into an aggregated electronic programming guide;

responsive to receiving a selection of a channel associated with a video content program via the aggregated electronic programming guide, applying a customization rule to determine a preferred video content feed corresponding to the channel;

based on the determination, requesting, via the aggregated electronic programming guide, the preferred video content feed;

receiving the preferred video content feed;

decoding the received preferred video content feed for a signal corresponding to the channel;

providing the signal to a display device for viewing the received video content feed; and

providing a user interface including a listing of favorite video content programs provided by at least two of the plurality of video content feed providers, and wherein the favorite video content programs are determined based on user preferences associated with at least one of the plurality of video content feeds, wherein the user interface further includes a listing of recorded video content programs provided by at least two of the plurality of video content feed providers.

19. The computer readable storage device of claim **18**, wherein combining the guide data into the aggregated electronic programming guide comprises one or more of:

providing a user interface including a listing of video content programs included in the plurality of video content feeds provided by a plurality of video content feed providers; and

providing a user interface including a listing of recommended video content programs provided by at least two of the plurality of video content feed providers, and wherein the recommended video content programs are determined based on user preferences associated with at least one of the plurality of video content feeds.

20. The computer readable storage device of claim **19**, wherein determining favorite video content programs or recommended video content programs comprises applying one or more business rules.

* * * * *